August 2001

ISSN 0706-9413

# INFORMATION FORESTRY

**Canadian Forest Service • Pacific Forestry Centre**

**Victoria, British Columbia**

## In this Issue...

Sustainable Forests, Sustainable Forest Communities ..... 2

The Well Known Unknown: Ozone in the Ecozone ..... 3

Turning Over a New Leaf: Advancements in Leaf Area Index ..... 4

To Surpass a Mass of Grass: Biocontrol Gives Trees a Chance ..... 5

Developing an Aboriginal Forest Industries Council ..... 6 / 7

Directory of First Nations Forest Sector Businesses in BC ..... 8

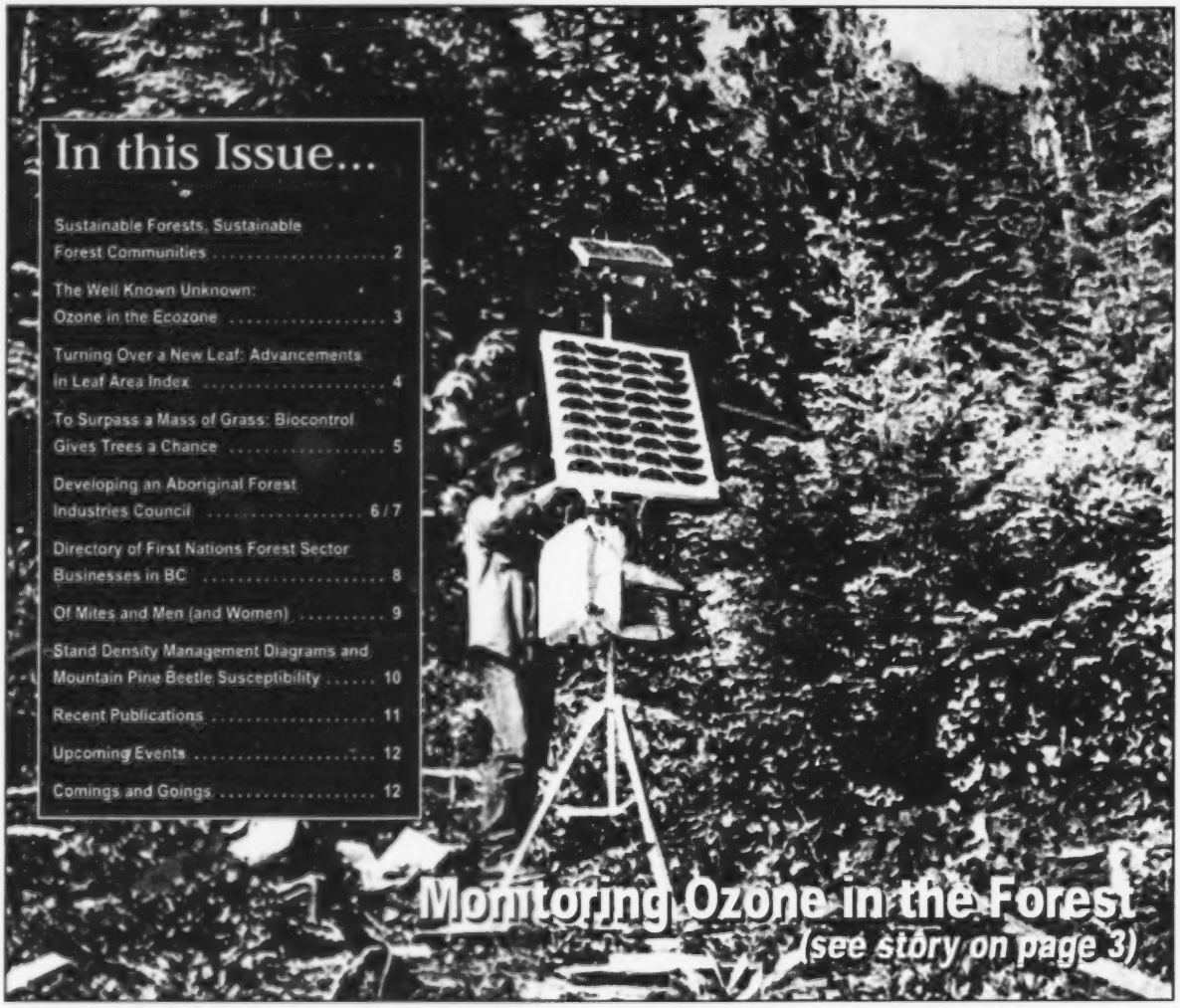
Of Mites and Men (and Women) ..... 9

Stand Density Management Diagrams and Mountain Pine Beetle Susceptibility ..... 10

Recent Publications ..... 11

Upcoming Events ..... 12

Comings and Goings ..... 12



**Monitoring Ozone in the Forest**

*(see story on page 3)*

Natural Resources Canada | Ressources naturelles Canada

Canadian Forest Service | Service canadien des forêts

Canada

2007-03430/



# Sustainable Forests, Sustainable Forest Communities

*"The community of place, or 'forest town' must not only have access to a productive forest, but it must have the capacity to manage it."*

It's hard to keep the home fires burning without wood to burn. So if you live in a forest-dependent community, you'll want to keep your forest stewarded in a sustainable manner not only for economic reasons but because it's an integral part of your sense of home. But in an industry where "cut out and get out" has been the historic rallying cry, can the forest as well as the forest community be sustainable? Dr. Bill Wagner, Model Forests Co-ordinator at the Canadian Forest Service, Pacific Forestry Centre has been studying the possibilities of sustainable forests and sustainable forest communities.

"Sustainable forest management involves creating a balance between the pillars of ecology, economy, culture and future generations," explains Dr. Wagner **(available at wwagner@pfc.cfs.nrcan.gc.ca)**. "But after more than a hundred years of 'cut and run' forestry, we have created a legacy of marginal forests, marginal mills and marginal forest industry towns. With a shift of control from large forestry companies to communities, local forests could be sustained to meet local values."

More than 80 percent of BC's exports are obtained from natural resources and almost 40 percent of the gross domestic product is from exports. Dr. Wagner believes that if the province can retain its position in these markets, there is the opportunity to reconstitute the forest sector as well as many of the resource-dependent communities.

He explains that sustainable forest management must involve the participation of three types of communities:

**Place** – communities linked by the physical location (e.g., a town)
**Identity** – communities linked by social characteristics that may transcend place (e.g., international interest in an environmentally-sensitive area)
**Interest** – communities linked by common benefits from a resource or costs imposed on a resource (e.g., the forest industry or a large multinational forest company)

Interaction of all three types of communities can provide the opportunity for the determination and consideration of key values, thus increasing the possibility that forestry decisions will prevail over the long term.

"Building a sustainable forest sector includes reconnecting the three types of communities to the resource. However, the community of place, or 'forest town' must not only have access to a productive forest, but it must have the capacity to manage it. This would require apportioning some of the provincial forest to the communities, and partnerships would be necessary between levels of government, industry and the community." To a certain degree, adds Dr. Wagner, the government of BC has already started this process with its community forest pilot projects.

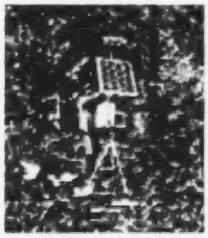
He further explains that to sustain both the forest and the resource-based community, decision-making authority over local resources must be given to the community to enable it to capture benefits locally. Maintaining a productive forest and diversifying forest uses are paths the community can take to sustain itself.

"Over the last century company towns have been built to support the forest industry. I am suggesting that a sustainable forest can support a community if that community has the competence and confidence to practice sustainable forestry locally. For some communities like Ocean Falls, BC, it may be too late. For others, however, I believe there is time for them to define their future."

*Building a shared community vision.*

# The Well Known Unknown: Ozone in the Ecozone

*"The 1200 metre site will be one of the first to measure ozone levels at such high elevations."*



*Cover story.*

*"The wind of change is blowing through the continent."* Past British Prime Minister Harold Macmillan's words could be applied to North America today. As the population continues to grow, air pollution is increasing and reaching remote regions downwind from urban areas. How has this smog affected the Pacific coast of Canada and the United States? The answer may be "blowin' in the wind" of coastal forests.

More commonly known as the protective layer in the stratosphere, ozone in the lower atmosphere – produced by a reaction of hydrocarbons and nitrogen oxides in the presence of sunlight – is a major element of smog. The airborne transport of the gas from cities to remote forests has led to concern about its influence on forest health and long-term effects on biodiversity.

The Georgia Basin ecosystem of the Pacific Northwest is a unique area of magnificent beauty but is often hidden in smog. This air pollution challenge is being addressed by the Georgia Basin Ecosystem Initiative, a collaboration between Canadian and American governments, agencies, and communities throughout the area. Under this initiative, another multi-agency partnership, Pacific 2001, has been established by Environment Canada to study surface ozone and other fine particulate matter in the air.

*The ozone monitor and weather station being set up at 1200 metres on Alouette Mountain in Golden Ears Provincial Park.*

"The Canadian Forest Service is studying the effect of ozone on the forest under Pacific 2001 in collaboration with Environment Canada, the University of British Columbia (UBC), the UBC Research Forest, the BC Ministry of Parks and the Greater Vancouver Regional District," says Nick Humphreys **(available at nhumphreys@pfc.cfs.nrcan.gc.ca)**, a forest health technician at the Canadian Forest Service, Pacific Forestry Centre. "It is known that ozone is the most widespread air pollutant in Canada and that the Fraser Valley in the Georgia Basin is the third most polluted air shed in the country, having the highest ozone levels recorded in BC. But we don't yet know how those forests are responding to ozone exposure."

To answer these questions, the Canadian Forest Service is placing continuous ozone monitors along the north side of the upper Fraser Valley at elevation levels of 200, 400, 600 and 1200 metres and, in conjunction with the Greater Vancouver Regional District, at 100 metres. These sites will have adjacent weather stations collecting data on temperature, relative humidity, and wind speed and direction. Solar panels will provide electricity to the areas and a data logger will record readings on a 24-hour basis. Once ozone levels are determined and it is known which elevations have the greatest levels, ozone injury will be surveyed along horizontal transects.

"Ozone injures cell structures of plants but to what degree tree species are experiencing, for example, foliar injury, premature defoliation or growth loss is still being debated," says Humphreys. "Alpine forests may be some of the most polluted and ozone sensitive ecosystems in the country. The 1200 metre site is one of the first to measure ozone levels at such high elevations, so it will be interesting to see the results."

Adds Bruce Thomson, Head of Atmospheric Science at Environment Canada in Vancouver, "The field study, Pacific 2001, is aimed at providing the needed information on the chemical and physical processes involved in the formation of fine particulate matter and ozone to ensure that policy development is based on sound science. An important aspect of this study involves the impact of air pollutants on alpine ecosystems. The Canadian Forest Service research will be a big help in providing that scientific understanding."

# Turning Over a New Leaf: Advancements in Leaf Area Index

*"We now have actual angle distributions for the six species and conversion factors to compare among the various LAI definitions."*

Leaf area index (LAI) is the ratio of total area of leaves on a tree to the area of ground that it covers. As a means of quantifying biological and physical processes such as chlorophyll production and photosynthesis, LAI is used by both forest planners to assess growth potential, and by remote sensing specialists to update forest inventories. However, means of measuring LAI varies among researchers, making comparisons among studies difficult and time-consuming. As well, an accurate means of measuring is required to compare what is observed in remote sensing with what is actually in the forest. A Canadian Forest Service research scientist has been developing a framework to address these concerns.

*The LAI 2000 being used to measure leaf area under a pine tree.*

Dr. Hugh Barclay **(available at hbarclay@pfc.cfs.nrcan.gc.ca)**, working at the Pacific Forestry Centre, has been attempting to standardize the various measures of leaf area index by providing conversion factors among six conifer species. With three trees from each species, he studied a representative sample of 20 to 30 twigs on five branches of each tree.

"I measured the three-dimensional aspect of each twig by measuring the angle between the needle and the twig as well as the angle that the twig makes to the branch," says Dr. Barclay. "Using trigonometry I was able to reconstruct the angle that each leaf would make, thereby providing a general distribution for each of the six species. One of the reasons leaf angle distributions are important is that leaves are assumed to be randomly oriented for the use of certain instruments, such as the LAI 2000, that try to estimate leaf area."

The distribution of needle angles was studied among shade-tolerant and shade-intolerant trees. Reinforcing what has been suspected for some time, this research verifies that a tree's needles are orientated to capture as much light as possible. Needles of shade-intolerant trees grow both vertically and horizontally to make the most of the sun as it "moves" across the sky. Shade-tolerant trees have mostly horizontal needles to maximize light collection as it shines vertically through gaps in the canopy. For example, grand fir is shade-tolerant and has primarily horizontal foliage. However, foliage at the top of the tree is relatively vertical as the light shines more directly.

"Sun and shade foliage is not new science," explains Dr. Barclay. "but what is new is that we now have actual angle distributions for the six species and conversion factors to compare among the various LAI definitions. As well, by studying the patterns that emerged among these foliage samples, generalization to other coniferous species is possible."

Dr. Barclay further explains that a nineteenth century mathematician, Augustin-Louis Cauchy, proved that the projection of any convex solid randomly orientated in space will be approximately one-quarter of its total area. Four of the species in this study – western hemlock, Sitka spruce, Douglas-fir and lodgepole pine had projected areas almost exactly one-quarter of the total area. Grand fir and western redcedar, however, had projection coefficients greater than one-quarter because leaves on these species are not randomly oriented but flat or virtually horizontal.

Discovery of such differences, coupled with LAI standardization, is important in remote sensing. A remotely sensed image may indicate vegetation in an area, but that may only be a fraction of the actual forest.

"For example," says Dr. Barclay, "there would be a greater variability in apparent LAI in remotely sensed images of western redcedar and grand fir as the view angle changes than there would be for western hemlock and Sitka spruce, owing to the more nearly horizontal angles of the leaves in western redcedar and grand fir."

LAI is one of the most significant parameters for assessing forest productivity, thus research continues in obtaining accurate measurements from both satellites and on ground.

# To Surpass a Mass of Grass: Biocontrol Gives Trees a Chance

*"We've developed a method of controlling the grass by combining two endemic organisms which are environmentally benign."*

Following harvesting, a thick mass of *Calamagrostis canadensis*, also known as bluejoint or marsh reed grass, can be a serious competitor to conifer regeneration in western boreal forests. Besides competing for nutrients, water, space and light during the growing season, bluejoint creates a thick biomass in the fall which can smother seedlings, inhibit seed germination, and cause tree deformities. As well, bluejoint litter can cause snow-press, delaying spring soil thaw and keeping soils cold and wet, unfavourable conditions for conifer roots. However, research at the Canadian Forest Service suggests that biological control (biocontrol) may be a viable means of suppressing bluejoint grass.

"We've developed a method of controlling the grass by combining two endemic organisms which are environmentally benign," says Donna Macey **(available at dmacey@pfc.cfs.nrcan.gc.ca)**, an ecophysiologist at the Pacific Forestry Centre. "Basically, plant pathogens native to the forest are collected and applied at higher concentrations in an attempt to suppress bluejoint growth without infecting conifers."

Inhibiting bluejoint is difficult because the plant's innate defences against disease are strong both above and below ground. For example, a few years ago, Dr. Richard Winder **(available at rwinder@pfc.cfs.nrcan.gc.ca)**, a microbial ecologist at the Pacific Forestry Centre, created a mycoherbicide from *Fusarium avenaceum*, a native fungus which caused leaf area damage to bluejoint. Though effective, the pathogen did not affect the root, so the grass kept returning. Likewise, Macey found that below-ground plant pathogens such as deleterious rhizobacteria were effective but not enough to sufficiently suppress bluejoint growth. However, the researchers have since combined both the foliar and bacterial pathogens to create a highly effective control method.

"In greenhouse tests, we've found that applying deleterious rhizobacteria in combination with *Fusarium avenaceum* provides a means to overcome plant defences and an opportunity for synergistic enhancement of disease," explains Dr. Winder. "The combination reduced shoot height by 70-80 percent and resulted in biomass reductions greater than 75 percent in bluejoint seedlings. And co-inoculation did not affect white spruce, lodgepole pine or trembling aspen seedlings."

The goal is not to eradicate bluejoint, as it is integral to the ecosystem, providing browse for moose, elk, and bison, as well as food and habitat for bears, small mammals and birds. It also helps to control erosion, provides stability to streambanks, maintains water quality, and reduces flooding.

"The goal is to manage its growth — it can grow as tall as two metres in some areas — and provide conifer seedlings with a chance to survive," says Macey. "Research indicates that if bluejoint is kept under control for three to five years after conifer seedlings are planted, the trees can outgrow the grass and have a good chance of survival."

There are other ways to manage bluejoint grass including applying chemical herbicides, livestock grazing, burning, mowing, mounding, trenching and mulching, but such methods may not be practical in all cases. Which vegetative control option is best is dependent on a number of factors specific to each site. The researchers emphasize that management techniques for undesirable vegetation work best when combined with other silvicultural practices.

Explains Dr. Winder, "An integrated strategy that combines biological control with low-impact silvicultural techniques to proactively control infestations before they begin will be most successful at reducing plantation failures and increasing productivity of conifers and hardwoods in areas of high risk for *Calamagrostis canadensis* invasion."

*Established, mature bluejoint grass,* Calamagrostis canadensis, *can suppress conifer seedlings.*

# Developing an Aborigin

*"AFIC will not only act as a united voice on behalf of aboriginal forestry companies, but will serve as a networking and technical resource centre."*

*AFIC membership will include any forest-related business interest.*

It can be challenging for a small tree to grow under the canopy of large trees. In the same sense, it can be difficult for small forestry businesses to become firmly rooted in the large forest industry. But, like trees in a forest during a windstorm, those businesses are better able to support each other if they are part of a common interest group.

In BC there are at least 217 forest-related businesses owned by First Nations and that number is expected to increase exponentially over the next decade. These businesses have common concerns unique to aboriginal forestry that will best be heard if represented by a single voice. Hence, the Aboriginal Forest Industries Council (AFIC) is being developed to advocate on behalf of aboriginal forest industry businesses.

The need for such an organization was recognized by the BC First Nations Forestry Program (FNFP) Management Board (a joint initiative between National Resources Canada, Canadian Forest Service and Indian and Northern Affairs Canada, established to enhance economic opportunities for First Nations). The Board established a subcommittee, the Forest Opportunities Working Group (comprised of members from First Nations, the BC Ministry of Forests, the Department of Indian and Northern Affairs Canada [DIAND], and the Canadian Forest Service), to investigate the level of interest in establishing such a trade affiliation. In 2000, the group queried 283 bands, tribal councils, forest industry businesses, governments and individuals in BC. Results indicated that 90 percent of those surveyed were interested in developing such an organization. Therefore, in February of this year, representatives from aboriginal forest companies and communities met with federal and provincial governments at a workshop to discuss the development of AFIC.

"The overwhelming consensus at the workshop was that AFIC is needed to establish a supportive and collaborative climate for new and existing aboriginal forest businesses," says Nello Cataldo **(available at ncataldo@pfc.cfs.nrcan.gc.ca)**, Collaborative Forestry Program Manager at the Canadian Forest Service, Pacific Forestry Centre and member of the FNFP Forest Opportunities Working Group. "The objective is to develop an aboriginal council in BC that will represent First Nations business interests in provincial forest industry forums."

AFIC will not only act as a united voice on behalf of aboriginal forestry companies, but will serve as a networking and technical resource centre for both established and emerging businesses to share technical information,

# al Forest Industries Council

obtain assistance, or advise about business development, planning, and operations.

"It will be an opportunity to learn from each other," says Ron Matthew, a First Nations independent contractor in Barriere, BC and member of the FNFP Forest Opportunities Working Group. "For example, by talking about my experiences in setting up my business, I may be able to help someone understand some of the steps that are required. And I could learn about what did or didn't work for other businesses which may help me make decisions in my own business."

Besides networking, AFIC could provide or coordinate training, consulting, marketing, purchasing or any other forest-related activity that its members decide upon. It is expected to focus on capacity building and will address issues with province-wide implications such as working with governments to create business opportunities within traditional territories, communicating with the non-aboriginal corporate sector to form viable partnerships and joint ventures, and promoting potential markets and trade within Canada and internationally. AFIC will protect First Nations interests in botanical forest products for medicinal, spiritual and nourishment purposes, and will promote sustainable land use management including developing forest-products certification for culturally sensitive forest practices.

Membership in AFIC will include First Nations tenure holders and potential tenure holders, existing joint ventures and First Nations businesses, value-added industries and wood processing groups.

"Membership will include any aboriginal business involved in any forest-related business ranging from botanical forest products to sawmills," says Gordon Prest, First Nations Forestry Coordinator at the Faculty of Forestry, University of British Columbia (UBC) and member of the FNFP Forest Opportunities Working Group. "Once AFIC has had time to build up its membership, structure and business constituency, it will be independent and self-governing."

Adds Cataldo, "Although the concept was initiated and supported through the First Nations Forestry Program, AFIC is to be an independent body with its own elected executive. The FNFP Forest Opportunities Working Group has been acting only as the temporary Board of Directors until an executive council is elected to formally launch the organization and continue to build and carry out the mandate."

AFIC will be a registered, non-profit society which will be apolitical and have no involvement with issues such as land claims.

For further information, check the web site: http://www.aficouncil.org.

*Some members of the FNFP Forest Opportunities Working Group (l-r): Gordon Prest, UBC; Bob Hart, DIAND, Bill Dexter, BC Ministry of Forests; Ron Matthew, North Thompson Band; and Nello Cataldo, Canadian Forest Service.*

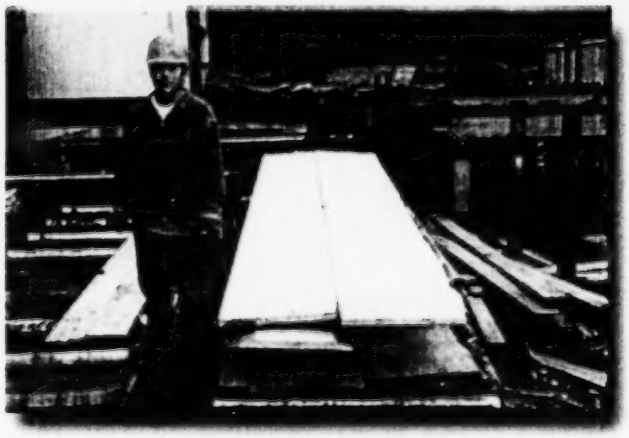
# Directory of First Nations Forest Sector Businesses in BC

*"The directory is a valuable resource for companies seeking First Nations expertise in a particular field."*

To "leaf" through a BC forest sector directory is to come across business names like Weyerhaeuser, TimberWest and Slocan. But now there is a new forest sector directory, one with names like Naut'sa mawt Resources Group Inc., Tl'etinqox Logging and Gwa'sala 'Nakwakda'xw Timber Corporation. The *Directory of First Nations Forest Sector Businesses in British Columbia* is a comprehensive list of First Nations-owned forest-related companies and enterprises in the province.

"There are numerous First Nations Forestry firms in BC but no one knows exactly how many or the range of businesses," says Art Shortreid **(available at ashortreid@pfc.cfs.nrcan.gc.ca)**, a First Nations Forestry Program Project Officer at the Canadian Forest Service, Pacific Forestry Centre. "This directory provides a list of 217 forest sector firms owned by First Nations as well as a brief description of each. It is expected that this list will serve as a networking tool among First Nations businesses and that the number of companies included in it will grow."

The directory is also a means for First Nations forestry companies to become more visible in the general forest sector and thus possibly broaden their access to the marketplace. Such visibility may also assist in establishing joint ventures or lead to possible funding opportunities for First Nations companies.



*The directory includes companies with a range of business activities.*

First suggested by the First Nations Forestry Program BC Management Board, the directory was also welcomed by organizations like the Council of Forest Industries (COFI) which represents over 100 BC forest companies and six trade associations. Many such organizations are very involved with aboriginal forestry but find it challenging to stay current with new developments among First Nations forestry companies.

The directory has a company list sorted alphabetically by name, address and contact, as well as a list sorted by First Nations band or Tribal Council affiliation, and another by geographic location. Companies are also listed by business activity, which ranges from archaeological inventory assessment to woodlot ownership by band.

"The directory is a valuable resource for companies seeking First Nations expertise in a particular field," says Marlie Beets, Vice President of Aboriginal Affairs at COFI. "It also provides a means of gauging growth in aboriginal people's involvement in the forest sector, which is something that COFI members have supported for years."

Adds Shortreid, "This directory could also provide the Aboriginal Forest Industry Council (AFIC) with a baseline of companies with which to build membership. Although no decisions have yet been made, it is hoped that either AFIC or another organization will maintain an updated database of First Nations forestry businesses so future editions will always reflect changes in the sector."

The current directory of aboriginal forest companies was created by sending survey forms to all First Nations and Tribal Councils in BC as well as to Aboriginal Liaison Advisors at the BC Ministry of Forests regional and district offices. Individuals within BC First Nations communities verified data and provided additional entries.

The 335-page book, *Directory of First Nations Forest Sector Businesses in British Columbia*, is available both in hard copy and in Adobe Acrobat format through the Canadian Forest Service bookstore at http://bookstore.cfs.nrcan.gc.ca.

# Of Mites and Men (and Women)

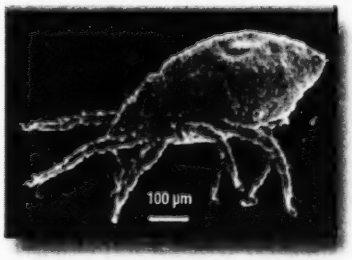
*"There is little doubt that microarthropods are a critical component in decomposition processes, nutrient cycling and soil formation, but the ecological roles of many are still unknown."*

Arthropods, or joint-legged organisms such as spiders and insects, are small compared to humans, but microarthropods such as mites, tardigrads, collembolans (springtails) are barely detectable by human eyes (ranging between 0.1 and 5 mm in size). Their small size and large number of species – an estimated 10,000 species in more than 700 genera and 250 families in Canada alone – makes the study of microarthropods challenging. But the Canadian Forest Service, Pacific Forestry Centre is collecting and identifying the most abundant and diverse microarthropods in forests, oribatid mites, to study their diversity and ecological role in the forest, and to determine their use as indicators of silvicultural and natural disturbances.

Microarthropods in soils have been studied for many years world-wide, but only in the past few years has anyone looked for them in the forest canopy in Canada. Although expected to be a sub-sample of soil fauna, canopy fauna is unique to the branches, needles and lichen of the canopy. Sixty percent of the oribatid mites found in forest canopies on Vancouver Island, BC are new to science (i.e., they have not yet been described or named and indeed, may never have been viewed by human eyes).

Until a species is confirmed as new to science, it can be frustrating trying to identify it because there are no formal species descriptions, they are not included in any identification keys (they have not yet been named or described) and the few keys that are available are incomplete and outdated. There are also taxonomic challenges. For example, the immature stages of a species are often difficult to associate with their adult stages. They often look and act differently and have occasionally been described as different species and even put in different families.

"There is little doubt that microarthropods are a critical component in decomposition processes, nutrient cycling and soil formation, but the ecological roles of many are still unknown," says Marilyn Clayton **(available at mclayton@pfc.cfs.nrcan.gc.ca),** microarthropod research technician at the Pacific Forestry Centre. "Details such as matching immature microarthropods to the adults and ensuring voucher specimens are accessible and properly preserved and archived are essential to our understanding of these processes."




*Adult stage of an oribatid species.*

Clayton explains that many questions remain unanswered. "How are human and natural disturbances affecting microarthropod species and what effect does that have on the health, longevity and sustainability of our forests? What is the distribution of these species in BC, Canada, North America and the world? Do these newly discovered species also exist in similar microhabitats in maturing second-growth forests, on other tree species, or in different geographical locations? The truth is, we simply do not know because no one has really looked; however, the researchers here are addressing this issue. Accurate answers depend on accurate and detailed collections."

Not only does the Pacific Forestry Centre have the largest working (identified and unidentified) microarthropod collection in western Canada, it also contains the largest number of canopy voucher specimens in Canada. Reliably identified voucher specimens serve as a standard with which ecologists and foresters can compare specimens and make identifications. Such collections also offer the opportunity to continually validate completed research.

When a new species is named it must also be described and the authority will designate a single specimen as the holotype or type specimen.

"The type specimen becomes the definitive benchmark for that species and is typically deposited in an easily accessible and nationally recognized collection such as here at the Canadian National Collection of Insects and Arachnids in Ottawa," explains Dr. Valerie Behan-Pelletier, research scientist at the Research Branch, Agriculture and Agri-food Canada and the authority on oribatid mites in Canada, and one of the curators of the Canadian National Collection. "At the same time, the authority will also designate a series of paratypes. A few paratypes are typically deposited along with the holotype, but the rest are distributed to other well-established and maintained collections, such as the Pacific Forestry Centre, to aid future recognition of the species."

Although microscopic, microarthropods numerically dominate forest ecosystems and thus are invaluable to foresters and biologists in understanding forest ecosystem diversity, ecology, and subsequently productivity.

# Stand Density Management Diagrams and Mountain Pine Beetle Susceptibility

*"We really need to deal with the cause of the mountain pine beetle problem which is too much susceptible pine on the landscape."*

Lodgepole pine stands dominate much of the western Canadian landscape. These forests not only provide up to 50 percent of the BC Interior annual harvest, they also have recreational, aesthetic, and watershed values and provide a habitat for wildlife. Unfortunately, mature stands can become susceptible to outbreaks of mountain pine beetle, the most damaging insect of pine. Epidemic outbreaks can last 3 to 20 years, devastating thousands of square kilometres of forest and making long-term planning for timber supply and integrated resource management difficult. But with the aid of a new information pamphlet, land managers will be better able to examine the consequences of different stand management decisions on long-term susceptibility to mountain pine beetle.

The mountain pine beetle has been thriving after successive years of mild winters and warm, dry summers in the BC Interior. Aggressive fire suppression over the last 60 years and limited commercial harvesting of lodgepole pine prior to 1970 have resulted in very large areas of ageing, susceptible pine. Favourable weather and a susceptible forest can be a hazardous combination.

*A managed stand with low susceptibility to mountain pine beetle.*

"Constant vigilance and timely action (fall-and-burn treatments of infested trees or patch cutting) can effectively control small outbreaks in the short term, but this approach is risky in the landscape we have today unless coupled with a longer-term plan," says Roger Whitehead **(available at rwhitehead@pfc.cfs.nrcan.gc.ca),** a researcher at the Canadian Forest Service, Pacific Forestry Centre. "We really need to deal with the cause of the mountain pine beetle problem, which is too much susceptible pine on the landscape."

Years of research into the ecology of the insect and its host have resulted in an understanding of the relationship between stand density, tree vigour and development of mountain pine beetle outbreaks. Recent work at the Pacific Forestry Centre examining the effect of thinning on susceptibility to mountain pine beetle attracted the attention of Pat Martin, Stand Development Specialist at the Forest Practices Branch, BC Ministry of Forests. He has been developing a series of information pamphlets that use Stand Density Management Diagrams (SDMDs) to illustrate management for timber production, forest health, wildlife habitat, and stand structural diversity. The most recent of these is *"Reducing Stand and Landscape Susceptibility to Mountain Pine Beetle"* written in collaboration with Whitehead and Allan Powelson, a private forestry consultant.

SDMDs are graphical representations of stand development that illustrate relationships between stand density and parameters such as diameter, top height and volume generated by computer growth and yield models. When used with site index curves, age can also be considered.

"The overall strategy for managing landscapes with a large mature pine component should aim at creating a landscape mosaic where age-class, size, density, and species distributions do not favour the development of large-scale outbreaks," explains Whitehead.

"SDMDs are a useful aid in crop planning because they depict stand development through time and allow a rapid, preliminary

*continued on page 11*

***Stand Density Management Diagrams***
*(continued from page 10)*

consideration of density management options," adds Martin. "This new publication uses SDMDs to combine what we know about growth and yield with what we know about the biology of lodgepole pine, the mountain pine beetle, and the landscape. All this is synthesized into a tool that helps the land manager consider various silvicultural treatments to meet multiple objectives while avoiding landscape-level outbreaks in the future."

The pamphlet *"Reducing Stand and Landscape Susceptibility to Mountain Pine Beetle"* is available through the Canadian Forest Service bookstore at http://bookstore.cfs.nrcan.gc.ca.

To order publications on-line, visit the Canadian Forest Service Bookstore at:

**http://bookstore.cfs.nrcan.gc.ca**

Search our catalog of thousands of forestry publications. Order copies quickly and easily using a virtual "shopping cart."

# Recent Publications

**Directory of First Nations Forest Sector Businesses in British Columbia.** Shortreid, A.; Stennes, B. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria BC. (2001).

**The Bridge - March 2001.** Newsletter of the British Columbia First Nations Forestry Program. Stone, J., editor. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria BC. Co-published by Indian and Northern Affairs Canada. (2001).

**Building Strength - The North Thompson Indian Band is 'sharp' when it comes to sawmilling.** Stone, J., editor. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria BC. (2001).

**Building Strength - The Skeetchestn Indian Band is no stranger to forestry.** Stone, J., editor. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria BC. (2001).

**Forestry business planning guide. First Nations Forestry Program.** Anon. Natural Resources Canada, Canadian Forest Service and Indian Affairs and Northern Development Canada. (2001).

**Sustainable forest management. A continued commitment in Canada / L'aménagement durable des forêts.** Un engagement soutenu au Canada. Anon. Natural Resources Canada, Canadian Forest Service / Ressources naturelles Canada, Service canadien des forêts, Ottawa, ON. (2000).

**Publications digest for 2000 / Abrégé des publications pour 2000.** Anon. Natural Resources Canada, Canadian Forest Service, Headquarters / Ressources naturelles Canada, Service canadien des forêts, Administration centrale. Ottawa ON. (2000).

**Commercial thinning of mature lodgepole pine: results of "beetle proofing" research in the East Kootenays.** Whitehead, Roger. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria BC. (2001).

**Les fines des parcs de triage : du statut de déchet forestier à celui de matériau utile?** Preston, C.M; Forrester, P. Ressources naturelles Canada, Service canadien des forêts, Centre forestier du Pacifique, Victoria CB. Notes de Transfert Technologique 14. (1999).

**La décomposition polygonale : une procédure d'utilisation des données de télédétection pour bonifier les inventaires forestiers sur SIG.** Wulder, M.A.; Franklin, S.E.; Lavigne, M.B. Ressources naturelles Canada, Service canadien des forêts, Centre forestier du Pacifique, Victoria CB. Notes de Transfert Technologique 24. (2001).

# Upcoming Events

## Upcoming Events

**Old-Growth Forests in Canada: A science perspective**
**October 15 - 19, 2001**
**Sault Ste. Marie, Ontario, Canada**

A national science symposium and workshop for forest scientists, forest managers, and policy-makers with interests in Canadian temperate and boreal forests. The symposium and workshop will provide a forum for presentation and discussion of the science of Canadian old-growth forests. It is intended to draw the science together to help define and explain the attributes, ecology, and options for management of these forests.

For further information, check the web site at http://ulern.on.ca/oldgrowthforest/
or contact Bruce Pendrel,
Natural Resources Canada, Canadian Forest Service - Atlantic Forestry Centre,
Tel. (506) 452-3505, Fax. (506) 452-3140
E-mail oldgrowth@nrcan.gc.ca

---

**PartCuts 2001: Implementing partial cutting systems in forest operations**
**September 27 - 28, 2001**
**Williams Lake, BC, Canada**

PartCuts 2001 is the fifth annual equipment demonstration and workshop promoting the application and implementation of partial cutting.
For further information, contact Robin Clark,
Canadian Woodlands Forum Branch Coordinator at (604) 737-1112 or
E-mail rclark@cwfcof.org

# Comings and Goings

## Comings and Goings

Farewell to Dr. Eleanor White who has retired after 35 years with the Canadian Forest Service. As a research scientist, Eleanor's research has been on the molecular biology of host-pest interactions, including blister rust on western white pine, gall rust on lodgepole pine, Armillaria root rot, and spruce terminal weevil. She is best known for her ground-breaking work in applying DNA analysis to combatting tree theft.

Farewell also to Dr. Joji Iisaka who has retired as research scientist in remote sensing. Joji's work at the Pacific Forestry Centre involved automating the detection of terrain features such as forest clearcuts and access roads, and developing automated methods to evaluate landscape changes.


## INFORMATION FORESTRY

*Published by*

**Canadian Forest Service**
**Pacific Forestry Centre**
**Natural Resources Canada**
506 West Burnside Road,
Victoria, B.C., V8Z 1M5
pfc.cfs.nrcan.gc.ca
(250) 363-0600

**Writer**: Joanne Stone


Articles from this issue may be reprinted provided *Information Forestry* is acknowledged as the source of this material. We would appreciate notification if our material is reprinted.

For further information:
Phone: (250) 363-0606 Fax: (250) 363-6006
Email: jstone@pfc.cfs.nrcan.gc.ca

Information Forestry is also downloadable from our site at **www.pfc.cfs.nrcan.gc.ca**

**What do you like most about Information Forestry? Are there ways we can better meet your interests? Are there topics you'd like to see featured? We'd like to hear from you! Drop us a line at: jstone@pfc.cfs.nrcan.gc.ca**

© Her Majesty the Queen in Right of Canada, 2001
Printed in Canada